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Willingness to pay for improvement in the agricultural activities of some six selected villages in west Akim district of Ghana (emphasis on cassava)

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Abstract

Cassava is a tropical crop which originated from South America. Structured questionnaires were used to gather essential information on farmers' willingness to pay for improved cassava by means of contingent valuation Method (CVM). The Survey carried out in the West Akim District of Ghana shows that 54% are willing to pay for improvement in their agricultural activities. The varieties of cassava they cultivate are Madumaku, Otuaka, Bosuminsia, Bankyebrodee, Ankrah, Esiabeyem, Soshe, Ada and Krobo. OLS Regression results show that the area of land for cassava cultivation depends on the total acre of land the individual farmers possess, type of labour and the number of children they have and logistic regression results shows that, cassava variety, livestock and family labour are significant variables that affect the willingness to pay for improvement in their farming activities. It is recommended that a pilot project is set up in these communities so that those who are not sure will see the proposed improvement in agriculture in order to build up confidence in them.

Keywords: Cassava, Pay, Regression, Survey, Willingness

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1. Introduction

Cassava is believed to be a native to South America and is grown throughout the tropics. It is a perennial shrub of approximately 2 m in height and it is propagated vegetatively from stem cuttings of approximately 25 cm in length.

The plant is heterozygous and therefore seeds are only used in the breeding process. It has a great potential as a food, feed and bio-energy crop. Joaquim et al. (2004) identified a new cassava variety that can accumulate more sugar and high starch content. It is also observed that more than 100 times free sugar is accumulated in this new variety than the commercial varieties in Brazil.

Arable land for growing cassava may have to increase for bio-energy production, and that would also create more job opportunities and enhance export of bio-ethanol in energy hungry countries such as China and India. This can be achieved with biotechnology Jain (2001), and mutation induction, and also by exploiting cassava genetic resources and its genetic variation for breeding (Vollmann et al., 2004).

Thro et al. (1998) found out that useful variations in native starch quality altering the proportion of amylase to amylopectin, for instance, which changes the physiochemical properties of the polymer could open new market niches at better prices. Joseph et al. (2004) suggested that different mutants of cassava, varying in starch yield and composition would be a suitable material to study the mechanism of starch biosynthesis.

In Ghana it is one the most important food crops. Apart from Northern part of the country, all the others produce the tuber. Averagely the area cropped between 1999 and 2004 was about 750,000 Ha, with the main producers being the Eastern, Brong Ahafo, and Ashanti regions. The tuber has a number of uses in Ghana such as processing into gari, dough, tapioca, cassava flour and starch. All these products are for human consumption. The leaves are also consumed as a vegetable by some ethnic groups. In addition, the fresh tuber may be boiled and eaten as “ampesi” or pound into a paste (fufu) and eaten with soup.

A crop subjected to atomic energy either to preserve it or to change the genetic make has a number of negative perceptions from different categories of people. Some have the view that radiation from atom is carcinogenic and therefore will not go for any irriadiated material. Some too have different opinion about it. Most of the farmers in the Ghanaian economy are basically rural and contribute about 70% to the GDP but do not know much about radiation and crop production. It is therefore important to know people’s perception and readiness to accept as well as their willingness to pay for improvement in their crop using radiation. It is in view of this, that this piece of research is conducted.

1.1. Objectives

The main objective is to assess farmers’ willingness to pay for improvement in their cropping system by the use of radiation technology

Other objectives are:

- To find and describe their socio economic backgrounds.

- To describe the direction and magnitude of factors affecting prospective farmers willingness to pay for such improvement.

2. Methodology

The study employs structured questionnaires to gather essential information on potential willingness to pay for improvement using radiation by means of Contingent Valuation Method (CVM).The theoretical construction of willingness to pay for quality improvement shows that willingness to pay is a function of pre-policy and post-policy quality levels, among other variables (Whitehead, 1995). Contingent valuation method (CVM) surveys are carried out in a way that the individual respondents understands the quality levels of the good or items in question and the potential improvements the respondents are likely to get so as to avoid pseudo expression of willingness to pay (WTP) as described by (Mitchell and Carson 1989)

Blomquist and Whitehead, (1998) and Hoehn and Randall (2002) also have found out that respondents who are not familiar with goods are likely to provide less valid information and vice versa. For example, (Hurley *et a,l* 1999) had different willingness to pay level on delaying the contamination of nitrate in drinking water compared to that considered by (Stumborg et al., 2001) on reduction of contamination of phosphorous on the same respondents because the water quality level was not described carefully and comprehensively to these respondents and may lead to omission of variable which will ultimately cause biasness in the estimates of coefficients in econometric model .

Information such as farmers' background and factors that affect their willingness level are collected. The software called Econometric Views (E-views) is then is engaged to ascertain frequencies, as well as means and standard deviation of essential variables affecting willingness to pay. A logistic regression model is be used to test for these factors.

2.1. Model for willingness to pay for improvement

If the probability of willingness to pay for improvement is Ω then that for not willing to pay is given by $1-\Omega$ .The ratio, $\Omega/(1-\Omega)$ known as odd ratio, is the odd in favour of those willing to pay. When the natural logarithm is taken, it gives the log of odds ratio, which is estimated by the logit method. According to Gujarati, (1990) the logit model implies that the log of the odd ratio and is a linear function of the explanatory variables.

$$\ln(\frac{\Omega}{\Omega-1}) = \theta_0 + \theta_1\alpha + \varepsilon \qquad (5)$$

where, θ =Row vector of coefficients to be estimated α = Variables ε = Error term

2.2. Statement of hypotheses

The hypotheses to be tested are:

Ho: The factors under consideration exert no effect on farmers' willingness to pay for mutant cassava.

Ha: The factors under consideration exert an effect on farmers' willingness to pay for mutant cassava.

2.3. Data source and collection

Data is collected from of 91 households in the West Akim District of Ghana by means of structured questionnaires using simple random sampling technique. The villages interviewed are Asuokaw, Sukrong, Mepom, Krodua, Breman and Kwaa-Baah. The questionnaire is designed to gather information such as farmers' socio-economic characteristics and production activities with emphasis on cassava.

Information concerning farmers' willingness to pay is obtained using the contingent valuation method. This is done by giving a hypothetical situation. The hypothetical frame given to farmers is, should their output level increase by 25% or 50%, and will they pay for mutant cassava planting materials.

3. Results and discussions

3.1. The respondents' profile

This section describes some background information on the farmers and how they are ready to receive and to pay for improvement in their agricultural activities the demand for land for farming and the logit regression model for the factors affecting willingness to pay for improvement are investigated.

3.1.1. Sex distribution

Among the respondents interviewed in the District, 83 (91.2%) are males and 8 (8.8%) females. This is may be because males are known to engage in serious farming activities more than females in Ghana. Females are only known to offer helping hands to their male counterparts. This is true as it is observed across all the six villages interviewed.

3.1.2. Age distribution

Thirty-six (39.6%) are between the ages 20-30, 22 (24.2%) are 31-40, 17 (18.7%) fall within the age group 51-60 and 4 (4.4%) are above 60 years. Two (2.2%) did not reveal their ages. The mean age of the respondents is 37 years. This indicates that most of the respondents are young and active and would still be in business for the next forty years if they see farming as an enterprise with bright future for them and their families. It is also an indicator that most of the labour force are into farming and therefore would not find it difficult to put into practice any innovation made available to them. Most youth in the researcher's opinion are known to be early adopters due their high level of curiosity coefficient.

3.1.3. Level of education

Fifty-eight (68.1%) have 6-11 years of formal education followed by 21 (23.1%) having between 0 and five years of education, 8 (8.8%) have more than 12 years of formal education. This suggests that most of the rural farmers are now doing the farming job with some good number of years of education. Which also means agricultural officers may not find it difficult in educating them on how to use equipment and an innovation. Also, refresher courses, workshops and familiarization courses will not be much of a sweat when it comes to upgrading farming activities in these villages.

3.1.4. Marital status

Observation from the survey shows that 66 (72.5%) are married, 20 (22.2%) are single, 3 (3.3%) are separated and 2 (2.2%) are divorced. This also reveals the level of responsibility of the farmers and their readiness to get progenitors who will take over their place when they die. Also most especially rural folks produce children to help them in their farming activities. Fifty-one (62.2%) have 0-3 children, 27 (27.1%) have 4 and 7, 4 (4.9%) have 8-11 children. Nine (5.8%) did not disclose the number of children they have. This augments the above fact that most of them want progeny to take their place and to help them in their farming activities.

3.1.5. Type of agricultural activities

When asked about the type of agricultural activities 66 (72.5%) said they are food crop farmers, 18 (19.8%) are food and cash crop farmer only 5 (5.5%) are cash crop farmers and 2 (2.2%) practice mixed farming. It is observed that food crop farming is basically done from hand to mouth (pure subsistence farming) in these villages. But there is high probability that they will adopt and expand their farms for excess supply for the local market; already few supply the market with their produce. Those who are into food crop are mainly cassava farmers with 63 (69.2%) of them engaged in this venture, 19 (20.9%) do both cassava and maize farms and nine (9.9%) into maize and yam farm. Thirteen (61.9%) who are into cash crop are cocoa farmers, 6 (28.6%) are oil palm farmers and 2 (9.5%) engage in both oil palm, cocoa and citrus farming. See Figure below.

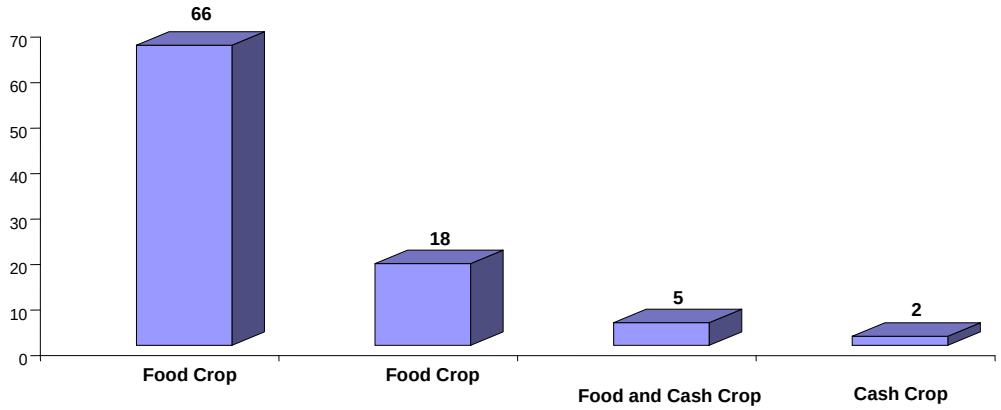

Figure 1. Type of agric activities

3.1.6. Planting materials

Planting material is the key ingredient in farming activities. The researcher's focus is on cassava farmers therefore questions where directed towards planting materials for cassava farmers as to how they get their planting materials. Out of the 91 interviewed, 62 (68.1%) get the materials free of charge from their friends and relatives, 17 (18.7%) hunt for them 8 (8.8%) buy them 3 (3.3%) use the previous harvest 1.1% did not indicate their source of planting materials implying that, cassava planting materials are available freely and therefore makes researchers finds himself between two worlds as to whether those peasant farmers would pay for the supply of improved varieties. Those who purchase said they buy bundles of the cassava at Gh¢ 2.00 and others do so at prices between Gh¢ 1.00 and Gh¢ 8.00. The gatherers also use 2-10 hours to get their planting materials, but most of them use 2- 8 hours round trip to get their planting materials for use.

3.1.7. Improvement in agricultural activities

Eighty-two (90.1%) need some form of improvement in their agricultural activities and 9 (9.9%) said they confide in their current agricultural activities and therefore are comfortable with their practices. Those who needed improvement said they want high yielding variety 35 (42.7%) said this, 31 (37.8%) want drought resistance, 4 (4.8%) are interested in high-yielding and disease free variety and 1 (1.1%) show interest in disease-free and drought resistant varieties. This indicates that majority are interested in high yielding and drought resistant variety. Development of such variety would not solve only their problems, but will cut across this District to the region and ultimately to the entire country.

3.1.8. Willingness to pay

When asked whether they will pay for such improvements, 40 (44.0%) said yes and 42 (46.2%) said no, 9 (9.9%) said yes but want to see the type of variety indicating almost break even in their willingness to pay.

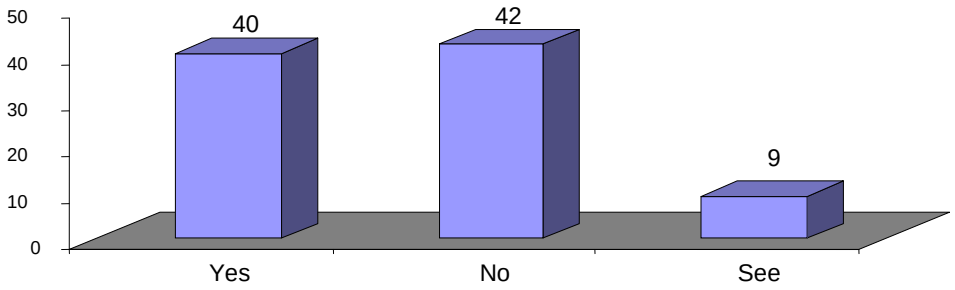

Figure 2. Willingness to pay for improvement

Sixteen (66.7%) said they will pay GH¢ 2.00 for a bundle of cassava if their output level increases by 25%, 8 (33.3%) will pay GH¢ 3.00 and 1(4.2%) GH¢1.00. Eleven representing (61%) of the respondents will pay

GH¢ 4.00 if their output level rises by 50%, 7 (38.9%) will pay between GH¢ 2.00 and Gh¢ 3.00, while others said they will pay above GH¢ 5.00 for similar rise in their output level. Nine did not decide on any amount until they see the so call improvement.

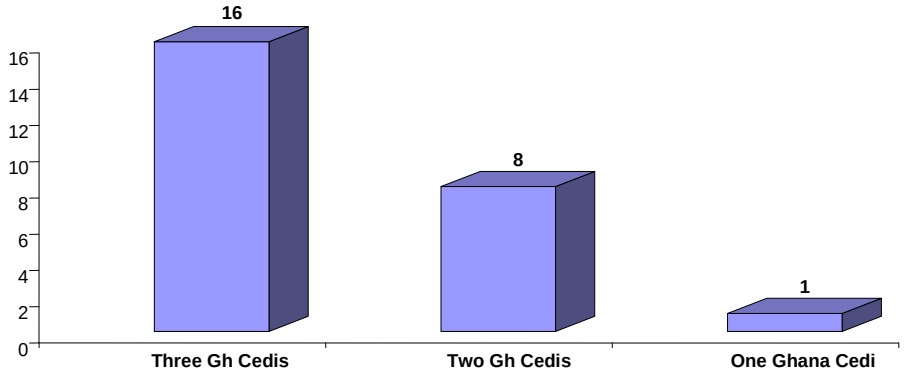

Figure 3. Willingness to pay (25% improvement)

3.1.9. Area of plot

Investigation by the researcher shows that farmers in these communities have area of land from 0.2-20 acres. Forty-nine (52.2%) of them have plot area between 0.2-2 acres, 42 (46.7%) have 3-10 acres and only one person has a twenty-acre plot of land. Out of this, 64 (70.3%) cultivate between 0.2-2 acre, 26 (29%) cultivate on between 3-10 acres of plot with one person (0.7%) on 15 acres of plot.

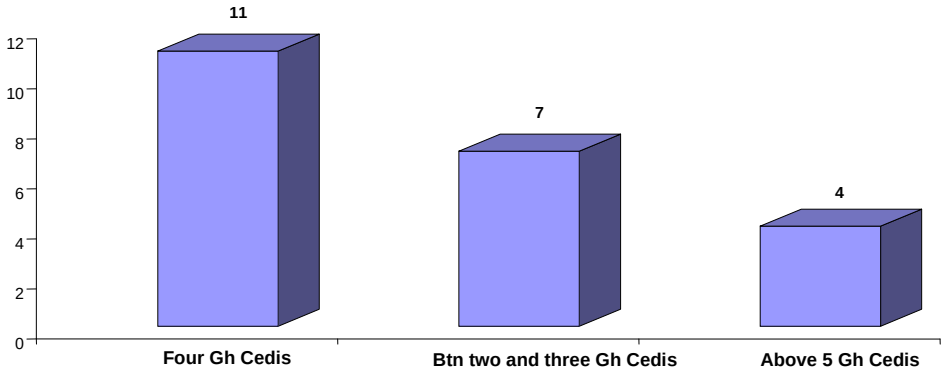

Figure 4. Willingness to pay (50% improvement)

3.2. Access to credit and fertilizer use

Eighty-six (97.7%) do not have access to credit, only 2 (2.3%) access credit, also 88 (97.8%) do not use fertilizer in their farms with 2 (2.2%) of them using fertilizer.

3.2.1. Labour use

Fifty (54.9%) use hired labour, 26 (28.6%) use family labour, 7 (7.7%) use both hired and family labour, 3 (3.3%) use 'nnoboa' 2 (2.2%) engage in special arrangement and three use weedicide for clearing their farms. The hired labour is paid Gh¢ 3.00 per rope (12 square metres) for using cutlass and Gh¢ 4.00 when a hoe is used in weeding. The family labour employed is made up of the man and the wife but more often the man. This is true because men do most of the weedings and other farming activities, while women prepare meals for the men. The children are sent to school and only help during vacation. See Figure below.

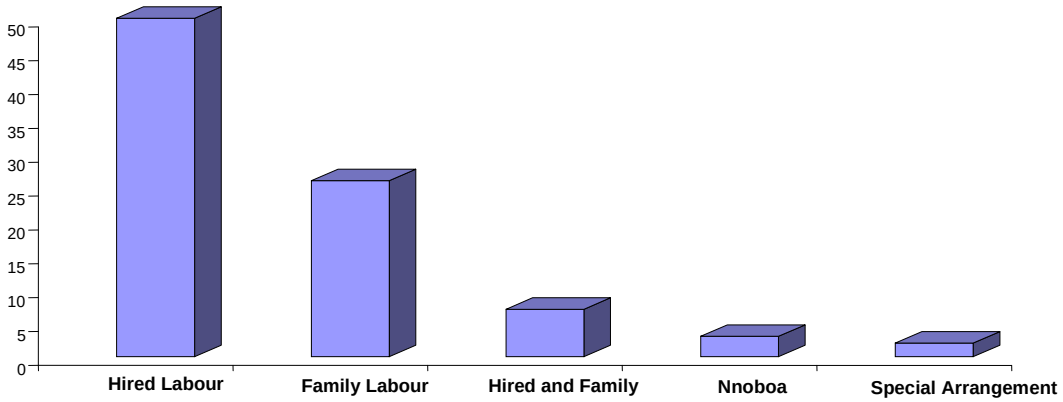

Figure 5. Labour source

3.2.2. Harvested cassava

Eighty-seven farmers of which 19 (21.8%) harvested nothing (cassava) last farming season, 31 (35.7%) harvested 0.2-1 acre, 35 (40.2%) harvested between 1-5 acres of cassava, 2 (2.3%) harvested 10 acres. The varieties of cassava they cultivate are Madumaku, Otuaka, Bosuminsia, Bankyebrodee, Ankrah, Esiabeyem, Soshe, Ada and Krobo. Among the varieties, 30 (33.0%) are familiar with madumaku, 20 (22.0%) said they know of madumaku, bosuminsia, otuaka, Ankrah and Esiabeyem, 16 (17.6%) know Otuaka, very well. Soshe, Krobo, Esiabeyem are among the others who are known by these villages.

Regression results shows that the area of land for cassava cultivation depends on the total acre of land the individual farmer possesses, dummy of source of labour, and the number of children they have. Education is not a significant factor, which is contrary to Afari (2001) who found that, low productivity in Ghana may be attributed partly to low skilled labour force, illiterate and semi-literate farmers who have persisted in the use of traditional farm implements and methods in farming. The apriori expectations for current plot of land

under cultivation and number of children were met (all positive); labour dummy has a negative apriori, meaning, the level of hired labour affects the area of plot cultivated negatively. The above means a unit change in the area of plot available will lead to 0.659 change in the area of plot cultivated ceteris paribus, also a unit change in the number of children will lead to 0.167 change in the area of plot cultivated ceteris paribus and the marginal effect of labour dummy is .0140. The F value for the above is 23.45 and it is significant at 0.0% meaning there is an overall joint effect of the variables under consideration on the area of plot cultivated for cassava. R squared value shows that 69% of the variation in the dependent variable is explained by the independent variables.

Table 1. Summary of socio-demographic variables

Sample Characteristics	**Mean**	**Std. Dev.**	**Min. value.**	**Max value**
Age in years	37.4	12.2	20	68
Years of schooling	7.9	3.9	0	20
Number of children	3	2	0	11
Materials (purchased)	5.64	8.34	1	3
Gathered materials (hours)	4.9	2.7	2	10
WTP (25%)	3.1	4	1	2.5
WTP (50%)	4	1.2	2	2.5
Total acreage owned	3.1	3	0.2	20
Total acreage cultivated	2.5	2.5	0.2	1.5
Credit access	1.98	0.15	1	2
Value of item	3	0	3	3
Quantity of fertilizer	0.5	0	0.5	0.5
Value of labour	4.5	3.6	1	2
Cassava harvested (acre)	1.35	1.65	0	10
# sold last season	2.5	3.5	0	0.5

The logit regression results show that, cassava variety, livestock and family labour are significant variables that affect the willingness to pay for improvement in their farming activities. Family labour and cassava variety met the apriori expectation, meaning, the availability of family labour will make farmers pay for an improvement in their farming activities. Also those who cultivate madumaku will pay for such improvement in preference to those who cultivate other varieties such as Ada, Krobo, soshe etc.

Those rearing livestock will not pay for such improvement because may be they do not enjoy any positive impact on their farming endeavours in the short run. The constant term shows that there will be some a reduction in the level of willingness to pay taken all the all variables under consideration.

Table 2. OLS Regression Results

Variables	Coefficient	Elasticities	T	Significance
Constant	0.103	0.103	0.377	0.707
Sex dummy	0.037	-0.036	0.179	0.858
Years of school	0.002	0.016	0.157	0.876
Current area	-0.214	0.659	12.08	0
Labour dummy	-0.0204	0.167	-1.867	66
Number of children	0.53	0.262	1.989	0.05
Age in years	-0.007	-0.262	-1.43	0.157
Marital status	0.057	0.014	0.392	0.696

Table 3. Logistic Regression Results

Variables	Coefficient	Z	Significance
Years of school	-0.005	-0.059	0.953
Number of children	-0.101	-0.717	0.474
Dummy of labour source	0.649	0.991	0.322
family labour	955	2.027	0.043
Livestock dummy	-7.046	-1.288	0.198
Acreage of land under cultivation	0.212	1.487	0.137
Cassava variety dummy	1.093	2.242	0.025
Intercept	-3.029	-2.466	0.014

4. Conclusion and recommendations

Most of the farmers interviewed are males and 73% are food crop farmers. The varieties of cassava they cultivate are Madumaku, Otuaka, Bosuminsia, Bankyebrodee, Ankrah, Esiabeyem, Soshe, Ada and Krobo. Logistic regression results shows that, cassava variety, livestock, family labour and the constant term are significant variables that affect the willingness to pay for improvement in their farming activities.

4.1. Recommendation

About 90% of the respondents want some improvement in their farming activities therefore it is recommended that research bodies and government agencies should have a feasibility study in these villages to see the prospects in the area and how they can help improve their level of production.

Since 40% of the respondents are willing to pay for improvement in the production of cassava, it is a step in the right direction to introduce a pilot project in these communities so that those who are not sure will have a feel of the proposed improvement so as to build up confidence in the farmers.

Apart from the cassava they cultivate, the area has a high potential for rice production, scientist therefore have to look at this prospect to unearth this hidden potential which will ultimately help solve the recurrent commitment of huge amount of national income for importation of rice into the country. One of the areas recorded the first best farmer in the country when it was instituted in the 80s.

Local farmers should be educated on some of the usefulness of radiation as an important tool to help solve their problems not only as a means for improving production level but for preservation and decontamination of their harvested crops. This can be done through seminars, workshops, interviews and media programmes (mass and print)

It looks as if the purpose for which Agriculture Development Bank (ADB), Rural Banks and other financial institutions which is geared towards agriculture development in the rural area is not operational at all in these areas. Most complain that the bankers refrain them from taking loans because they have the view that agriculture in Ghana is purely rainfed and farmers are not in good standing when it comes to loan repayment especially during unfavourable weather therefore government should help these poor farmers to acquire loan for large scale production. Also establishment of crop insurance to take care of crop failures during adverse conditions will be a major boost to rural agricultural development in Ghana.

Establishment of research fund just as we have GETFund for researchers to access it for research work will also not be a bad move towards rural agriculture development. It should be borne in mind that about 70% of these peasant farmers feed the entire population. The rural farmers should be held in high esteem.

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